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Moose Population Estimates for the Saskeram Wildlife Management Area: 1976, 1977, and 1981

Cross, Dale, Brian Knudsen, and Barry Jahn

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Prepared by:

Approved by:

A.H. Robertson
Supervisor

Merlin W. Shoesmith
Section Chief/Director

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ABSTRACT

The Saskeram Wildlife Management Area, located northwest of The Pas, contains 753 sq km of moose Alces alces habitat. Aerial surveys were conducted in the winters of 1976, 1977, and 1981, to allow the estimation of the size of the moose population in the Saskeram WMA. From 23% to 24% of the moose habitat was surveyed in each year. The population estimates for the 3 years were 484, 397, and 293, respectively. Confidence intervals (95%) ranged from +/- 25% to +/- 32% of the estimated population.

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Chris Gartner, George Oakes, and Reg Fast were the pilots, who contributed to the success of the work both by their careful flying and enthusiasm for the project.

Jerry Jacobson wrote the programs which were used to analyse the data and experimented with various survey techniques.

The work described here was conducted under the supervision and authorization of R.J. Robertson, the regional biologist in The Pas.

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INTRODUCTION

The Saskeram Wildlife Management Area (WMA) is an area of 959 sq km located northwest of The Pas (Fig. 1). Of the total area of the WMA, 753 sq km is moose habitat.

The Saskeram WMA has traditionally sustained a dense moose Alces alces population. In the early 1960's, most population estimates for the WMA were on the order of 500 animals (R.J. Robertson, pers. comm.). In the late 1960's and early 1970's, access by licenced hunters and Treaty Indian hunters to prime moose habitat in the Saskeram WMA increased, primarily because of the proliferation of snowmobiles. As hunters became more mobile, there was an increase in the annual moose harvest. Kills increased from approximately 30 per year in the mid-1960's to approximately 70 per year in the early 1970's (R.J. Robertson, pers. comm.). The current annual harvest by all hunters is approximately 50 animals.

During the early 1970's, the Manitoba Wildlife Branch's annual aerial surveys of the age and sex structure of the herd were suggesting that the moose population in the Saskeram WMA was decreasing. To determine whether the apparent decline was real,

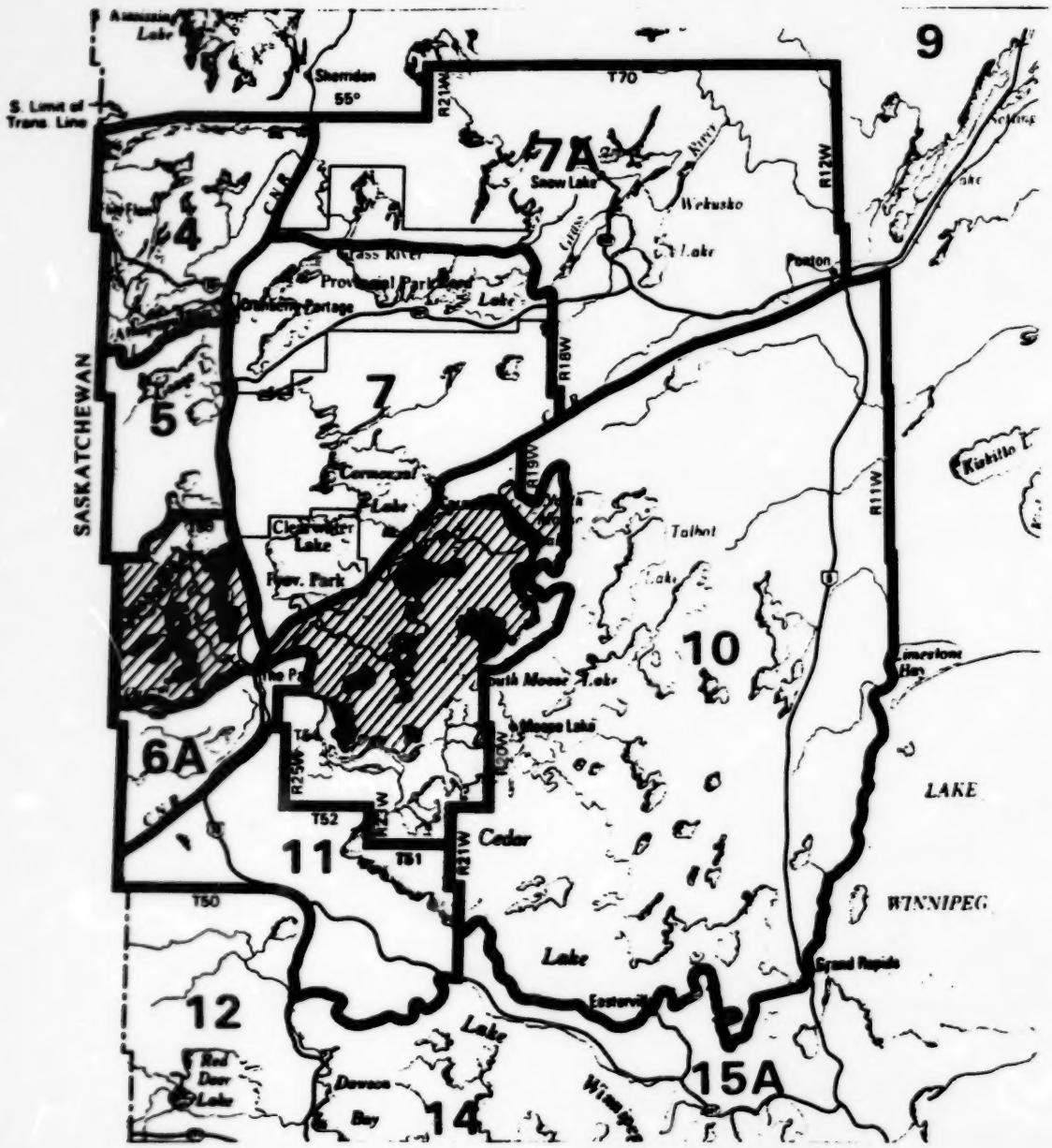

Fig. 1. The location and boundaries of the Saskeram WMA, and surrounding BHA's. The hatched area within BHA 6 is the Saskeram WMA. The hatched area within BHA 8 is the Tom Lamb WMA.

the Wildlife Branch conducted a series of aerial surveys in 1976, 1977, and 1981, with the objective of estimating the size of the the Saskeram WMA moose herd in each year. These surveys were flown in conjunction with moose surveys in WMA 8 (Cross et al. 1983).

METHODS

All of the surveys flown were strip-transect surveys (fixed width strips analysed as if they were long thin quadrats) (Eberhardt 1978). Fixed-wing aircraft were used for all flights. The comparative details of the surveys are given in Table 1.

Table 1. Major characteristics of the 3 aerial surveys of the Saskeram WMA.

YEAR	START DATE	FINISH DATE	AIRCRAFT	NUMBER OF OBSERVERS	RECORDER	HEIGHT (m)
1976	2 Jan	5 Jan	Cessna 180	2	yes	180
1977	15 Jan	17 Jan	Cessna 180	2	yes	180
1981	14 Jan	18 Jan	Piper PA12	1	no	180

All flying was done under the following conditions:

a) visibility greater than 15 km

b) maximum of 2 h survey time without a rest break

c) wind less than 30 km/h

d) all surveying between 1000 h and 1530 h

e) air speed no greater than 135 km/h

f) at least 15 cm of snow on the ground

g) all flight lines oriented north-south

f) all observations from the right side of the aircraft

Headsets were used to allow the observers, pilot, and recorder to talk to one another in the aircraft in 1976 and 1977. It is important to note that because of the communication system, the sightings of the 2 observers were not completely independent (cf. Magnusson et al. 1978). The boundaries of the strip to be watched by each observer, 203 m wide on the ground, were indicated on the aircraft with markers, both on the window and on the outside of the aircraft. The initial locations of these markers were determined geometrically. Final adjustments were made by flying over a known width strip to determine empirically the exact postion of the markers, as recommended by Caughley (1977).

Preliminary flights were conducted each year before the survey to ensure that maps, techniques, and personnel were all suitable and prepared.

In 1976 the recorder noted the sightings of both observers. He indicated on the data sheet the number of moose seen, the size of groups in which the animals occurred, and whether each moose was seen by the front observer only, the rear observer only, or by both observers. The 1976 survey indicated that the recorder was not required. Consequently, in latter part of the 1977 survey,

and in 1981, the pilot recorded the observations.

In 1981, the decision was made to use only 1 observer because of the local availability of a 2-passenger aircraft (Piper PA-12) which was more economical than a Cessna 180 and more appropriate for slow flying. During the 1976 surveys, both in GHA 8 (Cross et al. 1983) and in the Saskeram WMA, the front observer saw 93% of all the moose seen and the rear observer saw 96% of all the moose seen. These data suggest that there would be no significant loss in precision from using one observer (rear) only, flying at a slower speed.

All surveys were flown in the rectangular areas marked A and B in Fig. 2. Each of these areas represented sampling areas for 2 strata in a modified stratified random sampling design. (The starting point for the flying of strips was chosen randomly from 4 strips; the survey was systematic thereafter.) The boundaries of the 2 strata per se are shown in Fig. 3.

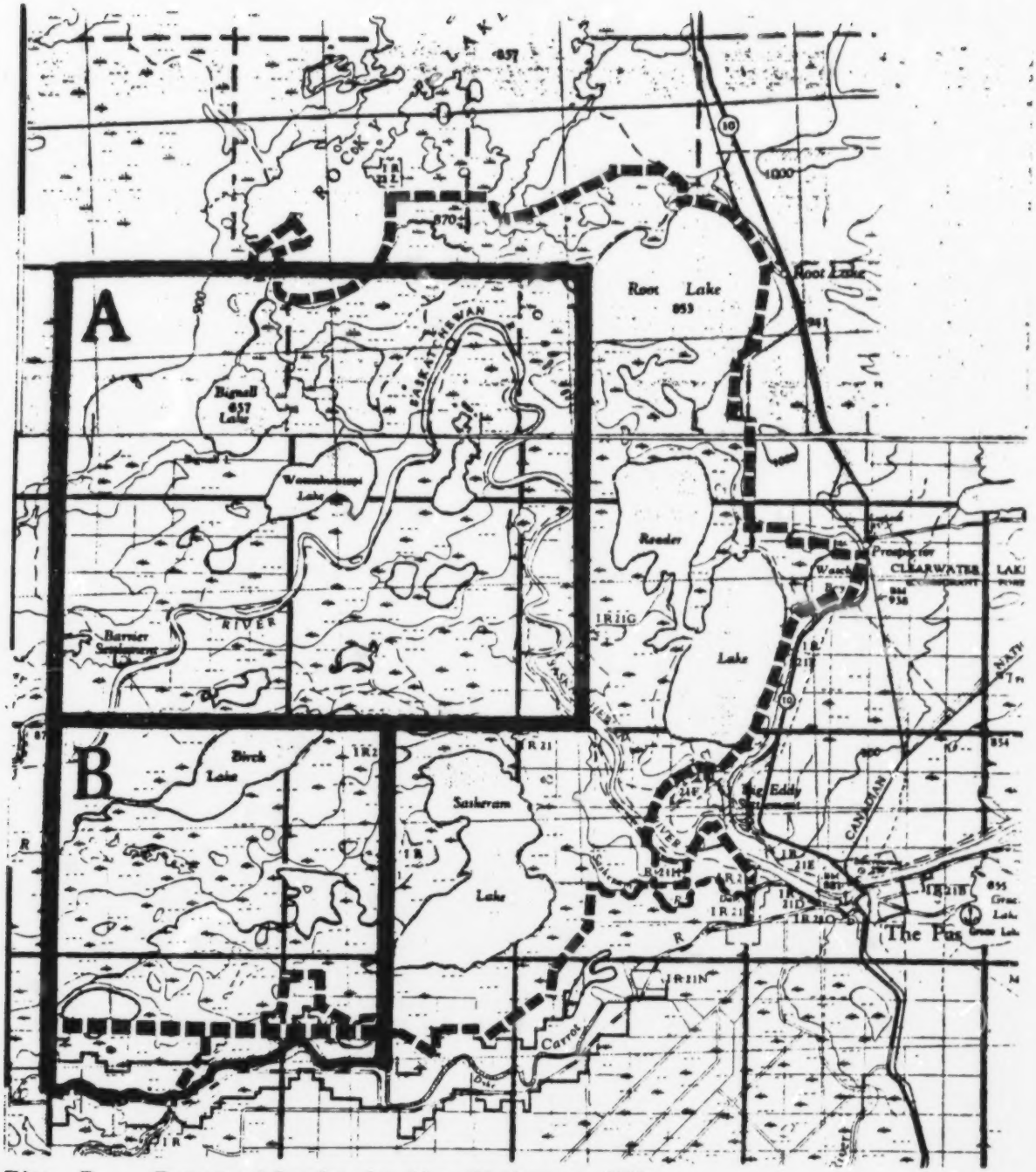

Fig. 2. Survey blocks in the Saskeram WMA.

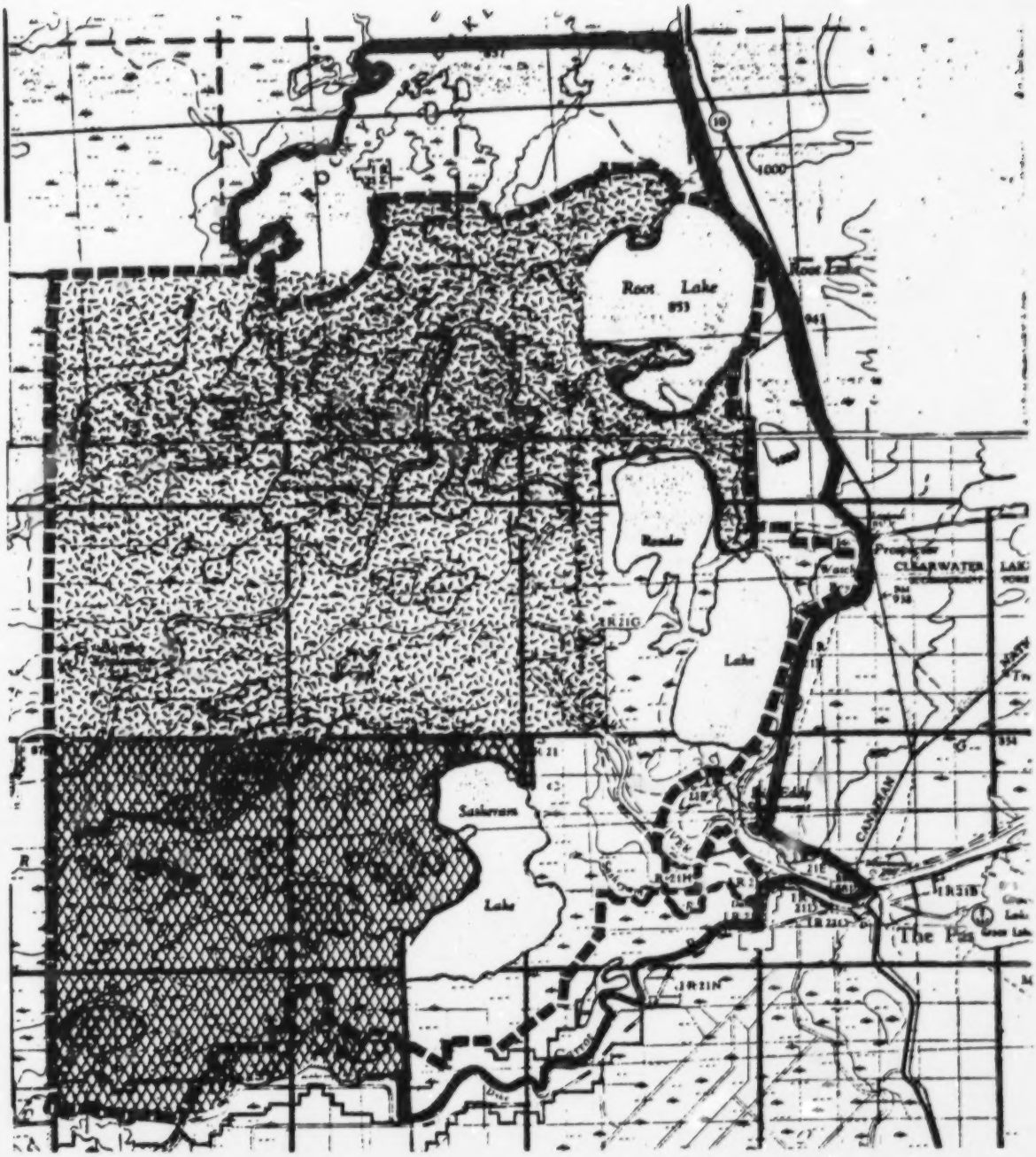

Fig. 3. The boundaries of the areas included in each of the 2 strata used in the stratified design. The flecked area is Stratum 1. The hatched area is Stratum 2. The broken line is the WMA boundary.

Table 2 gives the sampling effort, proportional areas, and approximate status of moose in the 2 strata. Although the survey was flown in strips, the data were treated as if they were collected in quadrats (Eberhardt 1978). The area of the quadrat was the length of the strip (either 19.2 km, 12.8 km, or 15.3 km) multiplied by the width (.203 km)

Table 2. The characteristics and size of the strata used in the stratified sampling design.

STRATUM NUMBER	SAMPLE BLOCK	QUADRAT SIZE	TOTAL QUADRATS	SAMPLE QUADRATS	DENSITY PER SQ KM *
1	A	3.9	133	28	0.73
2	B (1976)	2.6	91	24	0.46
2	B (1977,1981)	3.1	76	24	0.46

* These are approximate densities, intended only to indicate the approximate relative abundance of moose in the 2 strata.

Data were analysed in a stratified random sampling program (Jacobson and Weatherill 1975) on a desktop computer (HP 9830). Calculations followed Snedecor and Cochrane (1967) (see also Siniff and Skoog (1964)).

RESULTS

Tables 3, 4, and 5 show the results of the analysis of each year's data. In 1976, approximately 23% of the total of 753 sq km of moose habitat was surveyed. In 1977 and 1981, approximately 24% was surveyed. The sampling intensities within the 2 strata in 1976 were 21% and 26%, respectively. In 1977 and 1981, the sampling intensities were 21% and 31%.

The most important components of the above 3 tables are summarized in Table 6. Note that although the 95% confidence intervals for successive surveys are overlapping, there is an estimated decrease of approximately 100 animals per survey in this population.

Table 3. Tabulated results of the analysis of 1976 data for the Baskeram WMA.

STRATUM NUMBER	TOTAL NO. OF QUADRATS	NO. OF SAMPLE QUADRATS	QUADRAT SIZE (SQ KM)	MEAN NO. MOOSE PER QUAD.	VARIANCE
1	133	28	3.9	2.78	4.99
2	91	24	2.6	1.25	4.28
TOTAL	224	52			

Mean number/square kilometer: 0.64

Estimated total population: 484 +/- 121 (+/- 25%)

Table 4. Tabulated results of the analysis of 1977 data for the Saskeram WMA.

STRATUM NUMBER	TOTAL NO. OF QUADRATS	NO. OF SAMPLE QUADRATS	QUADRAT SIZE (SQ KM)	MEAN NO. MOOSE PER QUAD.	VARIANCE
1	133	28	3.9	1.82	4.89
2	91	24	3.1	2.04	4.04
TOTAL	224	52			

Mean number/square kilometer: 0.53

Estimated total population: 397 +/- 113 (+/- 28%)

Table 5. Tabulated results of the analysis of 1981 data for the Saskeram WMA.

STRATUM NUMBER	TOTAL NO. OF QUADRATS	NO. OF SAMPLE QUADRATS	QUADRAT SIZE (SQ KM)	MEAN NO. MOOSE PER QUAD.	VARIANCE
1	133	28	3.9	1.53	2.78
2	91	24	3.1	1.17	4.32
TOTAL	224	52			

Mean number/square kilometer: 0.39

Estimated total population: 293 +/- 93 (+/- 32%)

Table 6. A comparison of the results of the surveys of 1976, 1977, and 1981 in the Saskeram WMA.

YEAR	ESTIMATED POPULATION	95% CONFIDENCE INTERVAL	DENSITY PER SQ KM
1976	484	363 - 605	0.66
1977	397	284 - 510	0.53
1981	293	200 - 386	0.39

DISCUSSION

The results of the surveys show that the moose herd in the Saskeram WMA has been in a period of decline since the mid-1970's. The estimated loss of 100 animals per survey from the population is especially serious for this population for two reasons:

1. The area is capable of supporting approximately 600 animals, under ideal conditions.
2. The potential for this area to receive immigration from neighbouring areas of moose habitat is very limited. It appears that the only likely source of immigration to replenish animals lost from the Saskeram WMA is from the west, in Saskatchewan.

To manage the the Saskeram WMA herd with the objective of reversing the decline of recent years, it will be necessary to

continue to fly surveys such as have been described here. Determinations of allowable harvests and forecasts of population trends will require solid estimates of the size and the structure of the herd. Estimates of the size of the population are required, not only for calculations within the Wildlife Branch, but for presentation to groups of hunters, both Treaty Indians and licenced, whose access to this herd will be influenced strongly by management plans.

LITERATURE CITED

Caughley, G.J. 1977. Analysis of vertebrate populations. Wiley, New York. 234 pp.

Cross, D, B. Knudsen, and B. Jahn. 1983. Moose population estimates for Game Hunting Area 8: 1976, 1977, and 1981. Department of Natural Resources, Wildlife Branch MS Report No. 83-24, 15 pp.

Eberhardt, L. 1978. Transect methods for population studies. J. Wildl. Manage. 42:1-31.

Jacobson, J. and R. Weatherill. 1975. Application of quadrat and strip plot sampling techniques to an aerial census of white-tailed deer in Manitoba's Interlake. Man. Dept. Mines, Res., and Environ. Manage., Winnipeg. 51 pp.

Magnusson, W.E., G.J. Caughley, and G.C. Grigg. 1978. A double-count survey estimate of population size from incomplete counts. J. Wildl. Manage. 42:174-176.

Siniff, D.B. and R.O. Skoog. 1964. Aerial censusing of caribou by stratified random sampling. J. Wildl. Manage. 28:391-401.

Snedecor, G.W. and W.G. Cochrane. 1967. Statistical Methods, 6th ed. Iowa State U. Press, Ames. 593 pp.

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